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Title: A TRAY FOR TRANSPORTING VEHICLE WHEELS AND/OR WHEEL  
RIMS AND A SUPPORT FOR USE WITH THE TRAY

**SUBSTITUTE SPECIFICATION TRANSMITTAL**

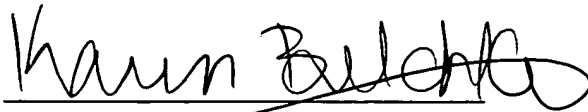
Mail Stop - PCT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

The attached substitute specification includes no new matter. Accordingly a marked-up copy of the substitute specification showing the matter being added to and the matter being deleted from the specification of record has been submitted.

Respectfully Submitted,

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A TRAY FOR TRANSPORTING VEHICLE WHEELS AND/OR WHEEL RIMS AND  
A SUPPORT FOR USE WITH THE TRAY

Reference to Related Applications

This application claims priority to PCT Application PCT/BR2003/000203 filed on  
5 December 23, 2002, which claims priority to Brazilian Application No. PI0205493-0  
filed on February 5, 2002.

Background of the Invention

The present invention relates generally to a tray accommodating and transporting  
10 wheels and/or rims of various diameters and configurations, as well as to a support for  
use with this tray.

Previously, wheels of automotive vehicles were only a vital accessory and did not  
provide the function of enhancing the appearance of the equipped vehicle. This role was  
provided by wheel caps.

15 However, over time and because of the development of the automobile industry,  
automotive wheels are no longer a mere vital accessory and have now a fundamental  
importance as a stylistic element of the vehicle, irrespective of its market segment.

Independently of their construction/configuration, wheels play an important role  
both in the appearance of the vehicle and in safety. After the wheels have been  
20 manufactured, they need to be transported very carefully because a scratched and/or  
squashed wheel loses its market value. The transport of the wheels may be carried out by  
any means, such as air or land, but generally, at least in Brazil, the wheels are transported  
by trucks on roadways which, as is well known, are excessively uneven. So, the wheels  
may suffer damages during their transportation.

25 The known trays designed for transporting wheels provide a safe transport, but do  
not provide transport for wheels of different diameters together. Usually, trays only  
accommodate wheels of the same diameter. So, if there is a need to transport wheels of  
different diameters, various trays have to be used.

Due to these drawbacks, various types of trays have been developed which enable  
30 one to transport automotive wheels of different diameters at the same time.

Document W096/24530 describes a tray for accommodating wheels including recesses that define circumferences of varied diameters and that have common stretches to accommodate wheels of different diameters. These trays can carry wheels of the same diameter at the same time, as well as mixture of two or three configurations of wheels.

- 5 The drawback of this solution is the large amount of material demand required to make this tray, which raises its market value due to the thickness necessary to form the layers for fitting the wheels.

- Document DE4339445 describes a tray provided with various configurations of guides for accommodating wheel rims of different diameters. The guides prevent the rims  
10 from moving to the sides and fit the rims into the tray. The guides are configured so that they will permit little flexibility with regard to the diameters of the wheels to be transported.

- Document JP8026283 describes a tray for accommodating and transporting automotive wheels which includes grooves in its surface that correspond to the diameters  
15 of the wheels to be transported. The grooves are configured so that the tray can receive and accommodate wheels of different diameters. The difficulty encountered in this solution is that it is expensive to manufacture the grooves.

- Document DE4229698 describes a tray for accommodating wheels of different diameters including transverse bars and frames composed of overlapped annular  
20 segments forming steps that accommodate wheels of different diameters. Each frame can accommodate at least two wheel configurations with different diameters according to the need. The transverse bars and the frames are assembled by various pieces that configure a complex and difficult-to-assemble tray. In addition, these frames allow the wheels to detach easily since they are not really fitted, but merely accommodated, in the steps.

- 25 Document DE4310373 describes an apparatus for stacking and transporting wheel rims. The apparatus includes a tray that accommodates wheel rims of different diameters which are fitted onto protuberances existing on the tray. The protuberances are provided such that they will accommodate rims of automotive wheels of different diameters and are configured so that only one rim size per use will be accepted. That is, wheel rims of  
30 different sizes may not be accommodated on the tray at the same time. This document also relates to wheel rims and not to the assembled wheel.

The prior techniques have not yet provided a simple and practical tray for accommodating wheels and/or wheel rims of different diameters simultaneously.

### Summary of the Invention

5           The present invention provides a tray for transporting and stacking wheels and wheel rims which is easy to use, has a low production cost and enables one to transport wheel rims and vehicle wheels of different diameters and/or configurations simultaneously. The present invention also provides a support for use with the tray as described above.

10           The present invention provides a tray, particularly for transporting wheels and/or rims of vehicle wheels, which includes at least one support having at least a first frame with at least one projection and that defines at least a first situation of interaction with a first wheel configuration. The support is provided with at least one second frame that cooperates with the projection of the first frame and that defines at least a second  
15 situation of interaction with a second wheel configuration.

          The present invention also provides support, particularly for use with a tray for transporting wheels and/or rims of vehicle wheels, which includes at least a first frame having at least one projection and that defines at least a first situation of interaction with a first wheel configuration. The support has at least one second frame that cooperates with  
20 a projection of the first frame and that defines at least a second situation of interaction with a second wheel configuration.

          The present invention has the following advantages, among others. For one, wheel rims and vehicles wheels of different diameters and/or configurations can be transported and easily manufactured simultaneously on a single tray. There is also an  
25 economies of scale. The wheel supports existing at the tray can be changed to bring about varied configurations for different types of wheels and/or rims. Finally the wheels and/or rims can be safely transported without the risk of damaging them.

### Brief Description of the Drawings

30           The present invention will now be described in greater detail with reference to an embodiment represented in the drawings. The figures show:

Figure 1 is a perspective view of a tray for transporting wheels and/or wheel rims of the present invention;

Figure 2 is a perspective view in detail of a component of a tray support of the present invention; and

5        Figure 3 is a top view of the tray for transporting wheels and/or wheel rims of the present invention.

#### Detailed Description of the Invention

As can be seen in Figure 1, a tray 1 for fitting wheels and wheel rims of the present invention includes a rectangular base to which at least one first support 2a and at least one second support 2b are associated. Both of the first support 2a and the second support 2b are preferably Y-shaped and define three projections that are offset 120° relative to each other.

Each first support 2a enables wheels of a specific and single diameter to be fitted. Each projection of the Y-shaped first support 2a is provided with a first bottom step 5a, a second intermediate step 4a, a third top step 3a and a top surface, the steps configuring a stair. The steps 3a, 4a and 5a define four first imaginary circumferences around the first support 2a having a central point at its center.

The steps 3a, 4a and 5a enable the wheels and/or the wheel rims to be fit such that they will not move while being transported and/or stacked. The flange of the wheel rim rests on the steps 5a, the steps 4a permit constriction of the rim, and the steps 3a permit constriction of the recess of the intermediate region of the rim, namely that of a smaller internal diameter. When a wheel is transported, the disc faces upwards, that is, it does not touch the first support 2a. Further, the wheel may be fitted such that the disc will face downwards. The mentioned constrictions are possible, because the three steps 3a and the three steps 4a define the already mentioned circumferences, the diameters of which cooperate with the respective points of the wheel rim.

However, one may design a first support 2a with which the wheel/rim interacts, or else it is fitted on other steps than those explained above and is included in the scope of the present invention.

As already mentioned, the tray 1 includes second supports 2b which enables different configurations of wheels/rims of different diameters to be fitted and transported. Each second support 2b includes a first Y-shaped frame 6 having three projections that are separated by  $120^\circ$  and two second frames 6' that cooperates with the first frame 6 and which are axially aligned and adjacent to two of the three projections of the first frame 6. Alternatively, the second frames 6' are positioned on the second support 2b in a different way, as long as they cooperate with the first frame 6 so as to enable one to transport wheels/rims of a first configuration and a second configuration, as will be explained later.

Thus, as in the case of the first support 2a, each of the the projections of the first frame 6 of each second support 2b includes a first bottom step 5b, a second intermediate step 4b, a third top step 3b, and a top surface, the steps consecutively configuring a stair. The steps 3b, 4b and 5b form four second imaginary circumferences around the first frame 6, and a central point is at the center of the first frame 6. The first frame 6 may be identical to the first support 2a.

The two second frames 6', the positioning of which has already been described, also include three steps: a bottom step 5c, a second intermediate step 4c, a third top step 3c, and a top surface, the steps consecutively forming a stair. The steps are equivalent to the steps of the first frame 6, that is, they have the same height, positioning and geometric relations.

The two second frames 6' form four third imaginary circumferences together with the adjacent projection of the second support 2b, which has no frame 6'. The third circumferences have diameters that are larger than those of the second imaginary circumferences which result from the displacement of their central point due to the positioning of the second frames 6'.

Thus, the second support 2b may fit wheels/rims of first and second configurations. The fitting is effected by the steps of both the frame 6 and the frame 6', which brings about a broader use of the tray 1 containing them, as will be better explained later.

The second support 2b has two possible situations of interaction for fitting the wheel. A first situation 100 occurs with the interaction of the first wheel/rim configuration on the first frame 6, wherein the flange rests on the steps 5b of the three

projections. The respective steps 4b permit constriction of the rim, and the steps 3b permit constriction of the intermediate region of the rim, that is, the region of smaller internal diameter. The constrictions are possible because the three steps 3b and the three steps 4b define the already mentioned circumferences, the diameters of which cooperate with the respective points of the wheel rim. When transporting a wheel, the disc faces upwards, that is, it does not touch the second support 2b. The wheel may also be fitted in such a way that the disc will face downwards.

A second situation of interaction 200 occurs when the wheel/rim has a diameter that corresponds to the second configuration and one of the projections of the first frame 6 cooperates with the second frames 6' where the flange of the wheel rim rests on the step 5b and on the steps 5c of the second frames 6'. The step 4b cooperating with the steps 4c permits constriction of the rim, and the step 3b cooperating with the steps 3c permit constriction of the recess of the intermediate region of the rim, namely that of smaller internal diameter. The second frame 6' is detailed in Figure 2.

Evidently, the second configuration of a wheel/rim to be transported in the second situation of interaction 200 has a diameter larger than that of the first configuration of wheel/rim to be transported in the first situation of interaction 100.

The tray 1 may have varying area, shape and height, and a single tray 1 may include several supports for wheels/rims of at least one smaller diameter and supports for wheels/rims of at least one larger diameter, enabling several wheels/rims of different diameters to be transported on a single tray. This provides an economies of scale. Also, the number of supports 2a and 2b on the tray 1 may vary according to its area and according to the need of each company. Alternatively, it is possible to provide a tray 1 that will include only the second supports 2b.

The second supports 2b are configured to preferably receive first and second configurations of wheels/rims having diameters that vary by three inches from each other, as for example 12" and 15", 13" and 16", 14" and 17", 15" and 18", 16" and 19", and 17" and 20", which are the most widely used diameters. However, the combination of diameters that may be fitted onto the same support may vary according to the need of the company. The only configuration that is difficult to carry out is that of the support for

fitting wheels of contiguous diameters, since the two frames 6 and 6' are very close to each other, making it difficult to fit the wheel in the first situation of interaction 100.

The supports 2a and 2b may be made from a material that is analogous to that of the tray 1, for example wood, and/or they may be made from a different material and fixed by any securing means. Alternatively, the supports 2a and 2b and the tray 1 may be manufactured as a single piece.

The supports 2a and 2b may have any other shape than that of a "Y" with the projections separated by 120°, such as a "T" shape or any other shape following the teachings of the present invention.

The supports 2a and 2b can also be removed and replaced by another support of another configuration, thus making the tray 1 of the present invention very versatile since it may have several supports for wheels of different sizes in a single configuration. This configuration may be modified, whenever necessary.

In the preferred embodiment, the tray 1 includes nine supports located on its top part arranged in a three by three configuration. A first row has three supports 2b, a second row has three supports 2a and a third row has three supports 2b. Evidently, the number of supports 2a and 2b may vary according to the area of the tray 1.

The trays 1 are provided such that they can be easily stacked and their bottom part may have any configuration so as to achieve the best interaction between the bottom tray and the top tray in a stack of trays, whether they are accommodating wheels/rims or not.

A preferred embodiment having been described, one should understand that the scope of the present invention embraces other possible variations, being limited only by the contents of the accompanying claims, which include the possible equivalents.

The foregoing description is only exemplary of the principles of the invention. Many modifications and variations are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than using the example embodiments which have been specifically described. For that reason the following claims should be studied to determine the true scope and content of this invention.